

Differential Effects of Wildfire Biomass Smoke Inhalation on Allergic Inflammation in Mice.

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Wildland fires emit high concentrations of airborne particulate matter (PM) and volatile organic compounds which can impact sensitive populations such as asthmatics. Health effects of these biomass emissions may vary significantly depending on fuel type and burn conditions. We assessed the relative acute toxicity of biomass smoke produced from controlled burns of peat, oak, or eucalyptus under smoldering (SM; 510 °C; ~40 mg/m³ PM) or flaming (FL; 640 °C; ~3.5-4 mg/m³ PM) conditions with equivalent carbon monoxide levels in house dust mite (Der p1)-allergic (HDM) Balb/cJ mice. Control and HDM-sensitized mice were all challenged with HDM 1 day before nose-only exposure to air, SM, or FL smoke (1 h/d x 2 d). Lung inflammation and histopathology were assessed in mice necropsied 4 h after the final exposure. Air-exposed HDM-allergic mice had significant increases in bronchoalveolar lavage fluid (BALF) eosinophils (EOS), interleukin (IL)-4, IL-5, and eotaxin compared with air-exposed non-allergic mice. Exposure to SM peat increased BALF neutrophils (PMN; P<0.05) and EOS (not significant) in comparison to air exposure in HDM-allergic mice, despite significantly lower IL-4 and IL-5 (P<0.05). SM peat-exposed HDM-allergic mice also had significantly higher BALF macrophages (MAC), PMN, and EOS (but similar IL-4 and IL-5) compared with FL peat exposure. In contrast to SM peat, both SM oak and SM eucalyptus exposures resulted in lower BALF MAC, PMN, EOS, and IL-4 in comparison to air exposure in HDM-allergic mice. Biochemical markers of lung injury (e.g. protein, LDH, albumin) were generally unchanged or slightly reduced following exposure to any SM or FL compared with air exposure in HDM mice. No consistent changes in BALF cells, cytokines, or biochemical markers were noted in non-allergic groups after SM or FL exposures. We conclude that SM peat emissions potentiate allergic inflammation and may worsen symptoms in sensitive populations to a greater degree than under FL conditions. Greater effects of SM peat emissions may correlate with higher (7-8x) PM polycyclic aromatic hydrocarbon (PAH) levels compared with SM oak or eucalyptus PM PAH levels. This abstract does not reflect US EPA policy.